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DSWA ltr., 18 Apr 1997; DSWA ltr., 18 Apr 1997

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# BUREAU OF SHIPS GROUP

## TECHNICAL INSPECTION REPORT

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Classification (Cancelled) (Changed to \_\_\_\_\_)  
By Authority of Joint Chiefs of Staff Action of 12 April 1947  
By Shaw Date 24 Apr 51  
P-5 AFS WP

### U.S.S. ARKANSAS (BB33)

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### TEST BAKER

Director  
Defense Atomic Support Agency  
Washington, D. C. 20301

[REDACTED]

### OPERATION CROSSROADS

### DIRECTOR OF SHIP MATERIAL

### JOINT TASK FORCE ONE

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9 BUREAU OF SHIP GROUP  
TECHNICAL INSPECTION REPORT

6 OPERATION CROSSROADS.  
U. S. S. ARKANSAS (BB33).  
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By Authority of Joint Chiefs of Staff Action of 15 April 1949  
By *John M. Bunker* Date *27 Apr 61*  
12 U. ATSWP

11 1947, 12 28P. 14 XRD-86

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U.S.S. ARKANSAS (BB33)

APPROVED:  
F.X. Forest,  
Captain, U.S.N.

[Redacted]

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U.S.S. ARKANSAS (BB33)

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U.S.S. ARKANSAS (BB 33)

SHIP CHARACTERISTICS

Building Yard: New York Shipbuilding Corporation.

Commissioned: 17 September 1912.

HULL

Length Overall: 562 feet 0 inches.

Length on Waterline: 554 feet 0 inches.

Beam (extreme): 106 feet 1 inches.

Depth (molded at side, to main deck, frame 69-3/4): 48 feet 8 1/4 inches.

Drafts at time of test: Fwd; 29 feet 10 inches.  
Aft: 30 feet 10 inches.

Standard displacement: 26,100 tons.

Displacement at time of test: 31,020 tons.

MAIN PROPULSION PLANT

Main Engines: Parsons Turbines.

1. Port and Starboard outboard shafts: Intermediate pressure ahead, and high pressure astern - direct connected.

2. Port and Starboard inboard shafts: Low pressure ahead, and astern turbines direct connected, high pressure ahead turbines via reduction gears.

3. Manufacturers: High pressure ahead by Newport News Shipbuilding and Dry Dock Co., I.P. ahead, and L.P. astern by New York Shipbuilding Corp.

Boilers: Four installed, Type - White - Forster, Mfg. by Babcock and Wilcox.

Main Condensers: Two installed, 15,230 sq. ft. cooling surface. Mfg. by New York Shipbuilding Corp.

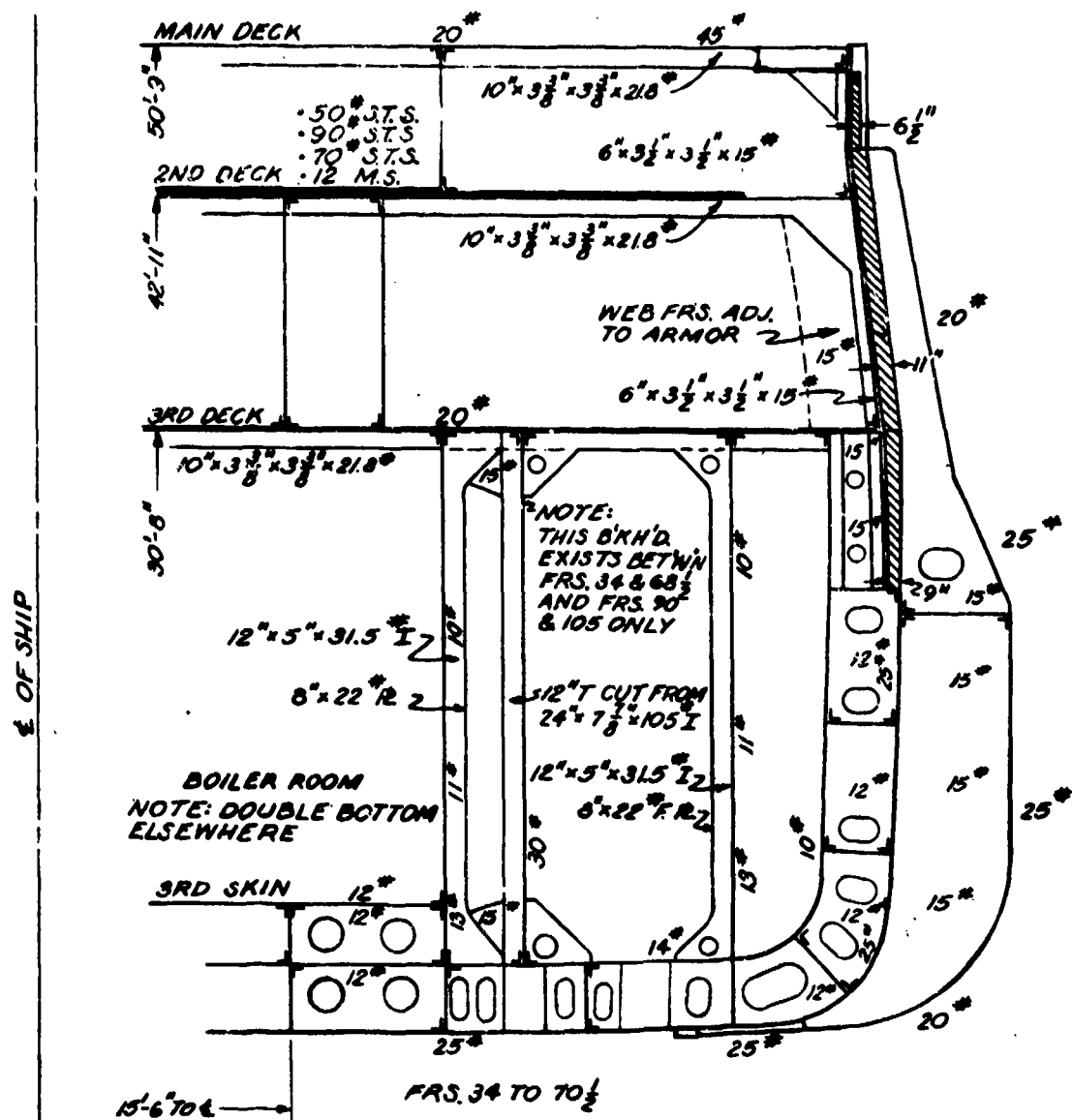
Reduction Gears: Single reduction, (inboard shafts only). Mfg. by Newport News Shipbuilding Co.

Main Shafts: Four installed, outside dia. 12 3/8", bore - 7 1/4. Mfg. by New York Shipbuilding Corp.

Propellers: Four installed, 3 blades. Mfg. by New York Shipbuilding Corporation.

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USS ARKANSAS (BB 33)



# MIDSHIP SECTION TEST B

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U.S.S. ARKANSAS (BB 33)

## TECHNICAL INSPECTION REPORT

### OVERALL SUMMARY

#### I. Target Condition After Test.

##### (a) Drafts after test; list; general areas of flooding, sources.

The ARKANSAS was sunk during test "B". The exact time and manner of her sinking is unknown. The ship was obscured by clouds one second after the burst, but she is known to have disappeared by 0844, 19 minutes after detonation.

The many holes and rivet seams which were opened throughout the entire length of the shell plating by the underwater explosion were the probable sources of flooding. A water wave which smashed over the ARKANSAS (see photograph on page 22) may have partially aided in swamping the ship.

No observation could be made of the ship's list. It is known from the divers reports that the ARKANSAS capsized for she is lying buried in the silt, bottom side up.

##### (b) Structural damage.

Approximately one second after the detonation, the ARKANSAS was obscured by the cloud formation. When clouds had cleared the ship was gone. The only structural damage observed in this one second interval prior to sinking was the toppling of the stack to port and a slight bending of the foremast. This damage was recorded on a high speed film, (approximately 1000 frames per second) Navy number 1428E. A few selected shots of this film are shown on pages 13 through 27.

The divers were able to examine only bottom and side shell plating because the ARKANSAS had overturned in sinking. The ship was found in one piece. The hull did not seem distorted, bent or twisted in its overall length. Most of the superstructure including stacks, boat cranes and masts is not visible and is presumed to have been driven into the coral silt on the lagoon bottom. The visible part of

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U.S.S. ARKANSAS (BB33)

the main deck near the deck coaming on the port side does not show extensive damage.

The only source of information regarding the damage to the ARKANSAS (other than the meager amount shown on the aforementioned high speed film) is the divers' reports. The following paragraphs are extracted from these reports.

Between the stern and frame 20 starboard and port, the breasthooks and bulkheads seem to have held fairly well. The plating has been indented (in some cases as much as six feet) and frequently has been torn and bent about the frames, breasthooks and bulkheads. There are numerous holes and deep dents in the shell plating in this area. A hole approximately five or six feet in diameter goes completely through both sides of the ship in the forepeak tank.

The most heavily damaged shell plate is in the area between frames 15 and 40. The transverse framing has failed, producing a deep washboarding effect. Butts and seams of the shell plating have parted in many places due to rivets shearing. Many holes in the shell plating are visible above the turn of the bilge. Below the turn of the bilge the holes diminished rapidly in number. The blister bounding angles were torn loose. The blister itself was heavily dented and bulged. Rivets had sheared at the blister seams and butts allowing the plates to spread as much as three feet in some places.

Just aft of number two turret at about frame 41, starboard, there is a large dent in the hull. Some indication of the size of the dent can be gathered from the fact it was so large as to cause the diver to erroneously report the ship broken in two pieces at this spot. It runs from where the ship is buried on the starboard side through the turn of the bilge. Its width varies from 15 to 20 feet. Its depth is unknown for it is filled with muck. Visible portions of this dent reveal no breaks or tears in the plating or failure of rivets.

Moving farther aft, beyond the heavy dent aft of number two turret, the pattern of the major damage changes again. Here the plates are bent in and out with the main type of failure being rivet failure at both longitudinal seams and butts. There have apparently

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been no tears in the plating in this area even through the rivet holes. There are several long ruptures at longitudinal seams. The three longest of these are in the bottom, two to starboard and one to port. The longest of these is about fifty feet running forward from number three turret and its greatest width is about 10 feet. The bottom is dented about six feet or more. In general, throughout this area, few seams have held. The plates are pushed in and out with a maximum of separation between plates being about twelve or fifteen inches.

Aft of frame 20 port, the washboarding effect diminishes more rapidly than on the starboard side. The blister has been torn loose from the hull between frames 20 and 40. Number two casemate has been torn loose. Aft of frame 40 to the stern and at the turn of the bilge and across the bottom, rivets are sheared and plates have spread at the seams and butts. In comparison with the starboard side, damage on the port side is at least 50% less.

Little is left of the shafting and the rudder has not been found. Only the port forward shaft without the screw has been found, and it is seriously out of line. No struts have been sighted and two large holes aft indicate the after two shafts have been completely torn out stern tubes and all, leaving the surrounding area badly distorted and broken.

The keel in general appears to be intact. Some rivets have parted and dropped free of the keel. There are some buckles of about one to two feet in way of all six turrets.

Both anchor chains had dropped clear of the forecastle and are lying in the silt. The chains lead forward and down into the silt at the hawse pipes.

(c) Other damage.

The only indication of the amount of internal damage was the finding of a large manifold, presumably fuel oil, and a small electric motor on the bottom shell. They apparently came through one of the many holes in the hull. Although there is no way of determining whence these parts came, they indicate serious damage to both piping and electrical equipment.

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## II. Forces Evidenced and Effects Noted.

### (a) Heat.

Undamaged.

### (b) Fires and explosions.

Unobserved.

### (c) Shock.

The toppling of the stack to port and the bending of the foremast, observed prior to descent of water column (photographs on pages 14 through 23) are presumed to be due to air blast.

### (d) Pressure.

Photographs taken approximately one (1) second after the explosion show a cavity in the rising column of water which is located at the spot where the ARKANSAS was moored, (see photograph on page 28). It may be inferred that the upsurge of water acted on the ARKANSAS from below and to starboard at a point approximately one third of her length from the bow. There is no further evidence of the continued presence of this vessel on this surface at any subsequent time. By the time the clouds of spray and steam had cleared away sufficiently to permit aerial observation, only a heavy oil slick remained where the ARKANSAS had been.

## III. Results of Test on Target.

### (a) Effect on propulsion and ship control.

Propellers and shafting were so seriously damaged that propulsion and control of ship was completely destroyed.

### (b) Effect on gunnery and fire control.

Unobserved.

### (c) Effect on watertight integrity and stability.

Completely destroyed.

### (d) Effect on personnel and habitability.

Any personnel topside would probably have been killed by

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the water column or washed overboard. All others would have gone down with the ship.

(e) Total effect on fighting efficiency.

Completely nullified.

#### IV. General Summary of Observers' Impressions and Conclusions.

Photographs of the burst taken from towers and planes, especially the high speed Navy film number 1428E, the reports of technical observer in PBM Charlie and the divers' reports are the total available sources of material for this report.

A pre "B" burst view of the ARKANSAS has been included in this report on page 12. This picture shows relationship of the ARKANSAS to the bomb carrying ship LSM 60.

The photographs on pages 13 through 27 were enlarged from the navy film 1428E. This definition is rather poor. Air blast damage was discovered and can best be seen by screening the film.

At the inception of the burst the foremast of the ARKANSAS can be seen upright. Photograph on page 13. However, in photograph on page 14, the first shot which shows the foremast silhouetted in front of the water shock wave and in subsequent photographs it is seen at an angle.

The stack can be seen being blown over by the air blast in photographs on pages 14 and 19.

#### V. Preliminary Recommendations.

None. It will be noted that the riveting resisted poorly the underwater shock.

#### VI. Pre-test Statistics.

(a) Instructions for loading the vessel specified the following.

ITEM	LOADING
Fuel oil	50%

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Diesel oil	50%
Gasoline	50%
Ammunition	50%
Potable and reserve feed water	95%
Salt water ballast	95%

Details of the actual quantities of the various items aboard are included in Report 7, Stability Inspection Report, submitted by the ship's force in accordance with "Instructions to Target Vessels for Tests and Observations by Ship's Force" issued by the Director of Ships Material. This report is available for inspection in the Bureau of Ships Crossroads Files.

The ARKANSAS at the time of "B" burst floated at drafts of 29' 10" forward and 30' 10" aft. She had no list.

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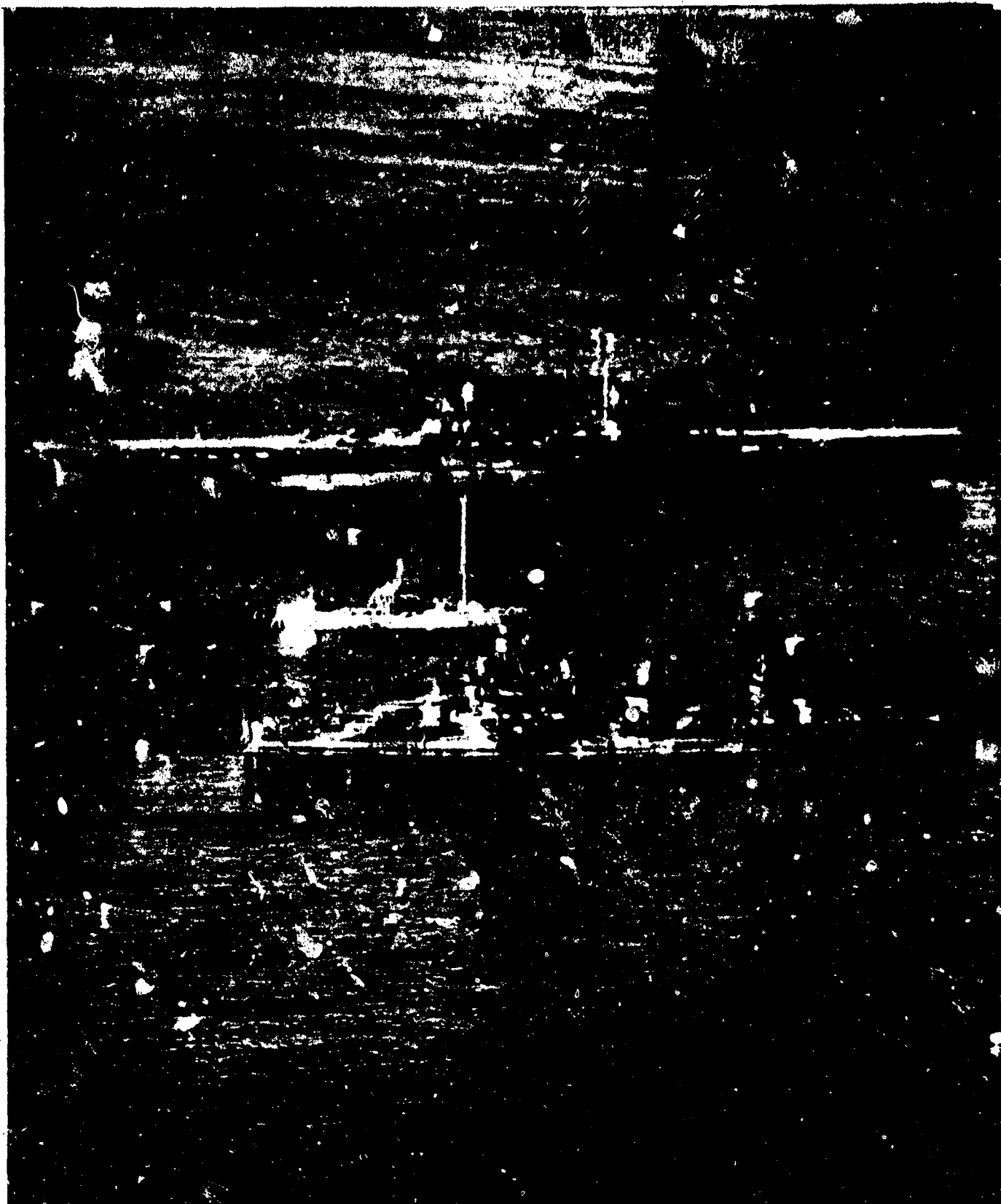
PHOTOGRAPHS

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DB-CR-113-286. Print 15. Pre "B" burst shot of ARKANSAS showing relationship with bomb carrying LSM 60 and SARATOGA.

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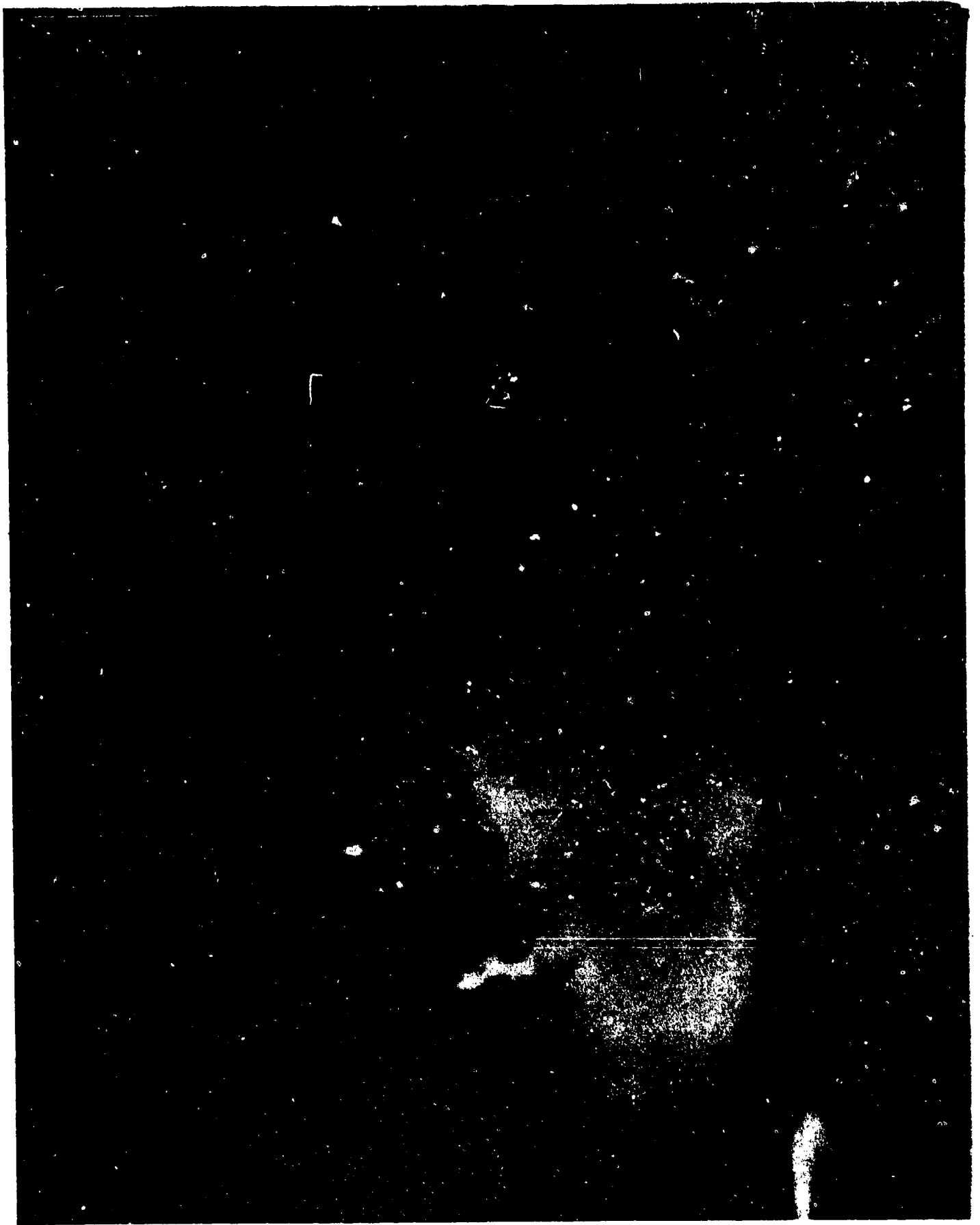
Navy film 1428E. Frame 24 - .024 second after explosion. ARKANSAS can be seen in lower right. SARATOGA visible in upper left.

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Navy film 1428E. Frame 181 - Underwater shock wave nearing  
ARKANSAS.

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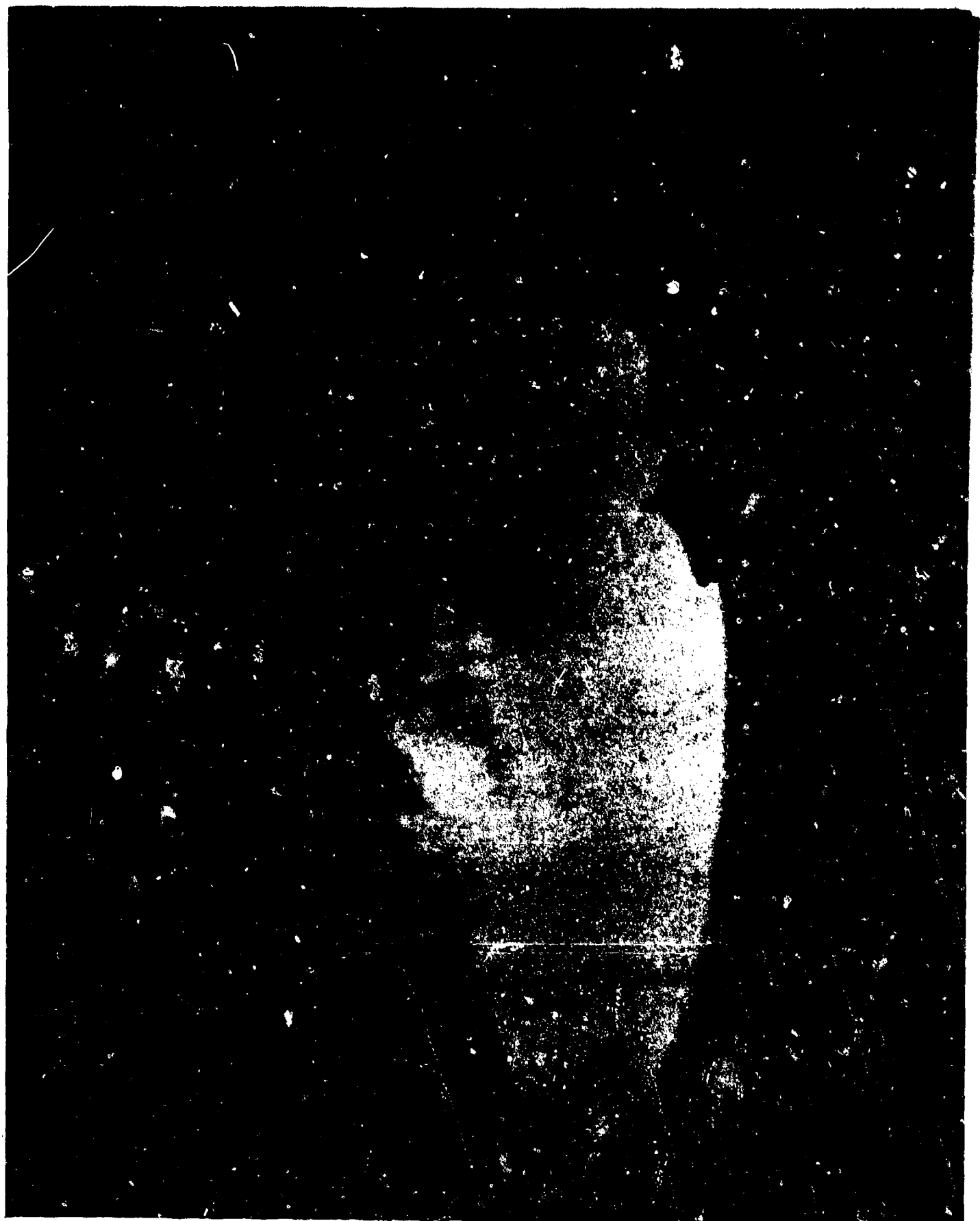
Navy film 1428E. Frame 222 -.22 second after detonation. At this moment stack and foremast start to bend.

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Navy film 1428E. Frame 269 - Stack goes over .27 second after detonation.

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Navy film 1428E. Frame 359 - Stack has been toppled.

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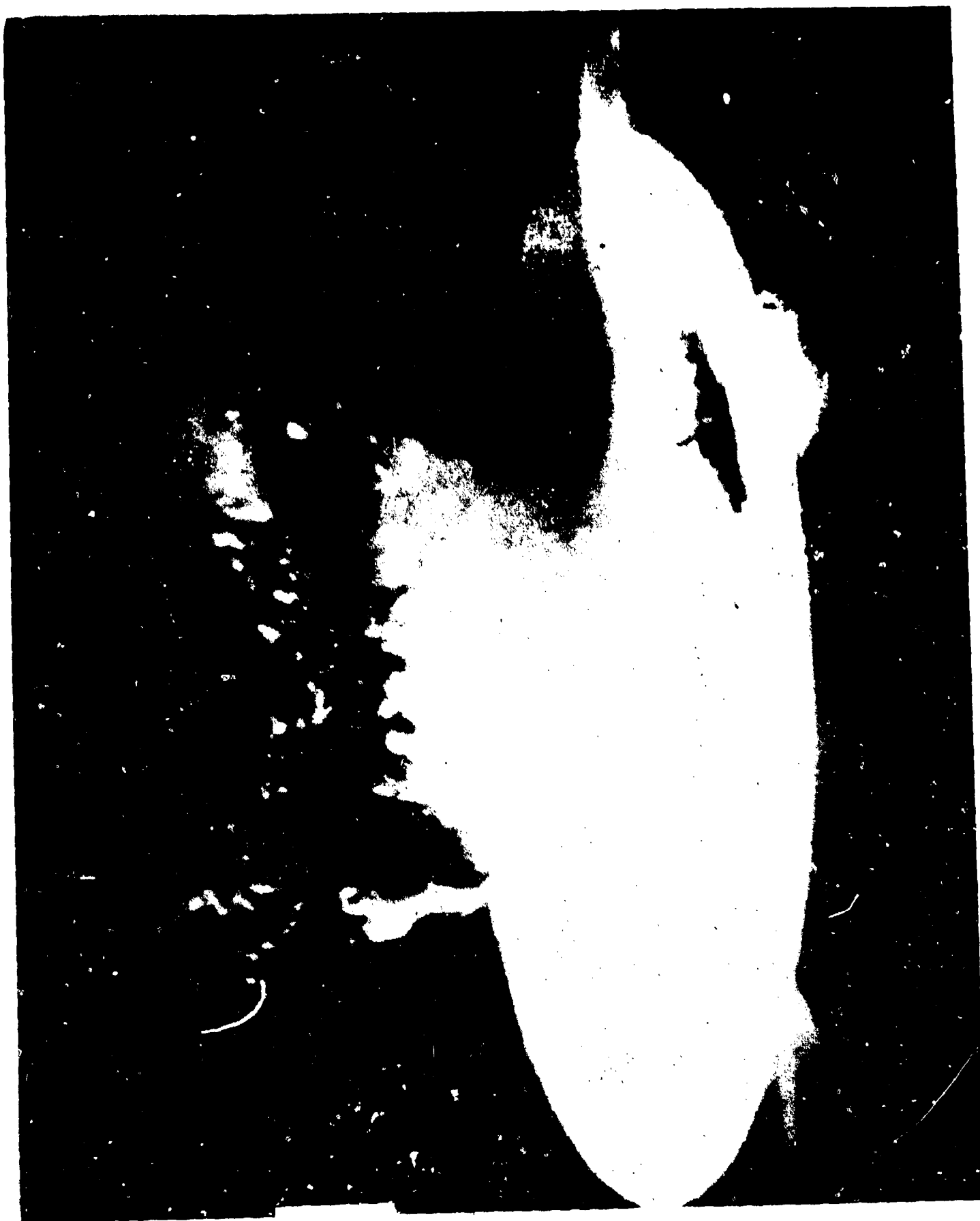
Navy film 1428E. Frame 3/8 - Foremast bent forward .38 second after detonation.

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Navy film 1418E. Frame 390 - Start of series showing wave breaking over bow of ARKANSAS, .39 seconds after detonation.

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Navy film 1428E. Frame 431 - .43 seconds after detonation.

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Navy film 1428E. Frame 503 - Bow wave breaking over ARKANSAS  
1/2 second after detonation.

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Navy film 1428E. Frame 637 - .63 seconds after detonation.

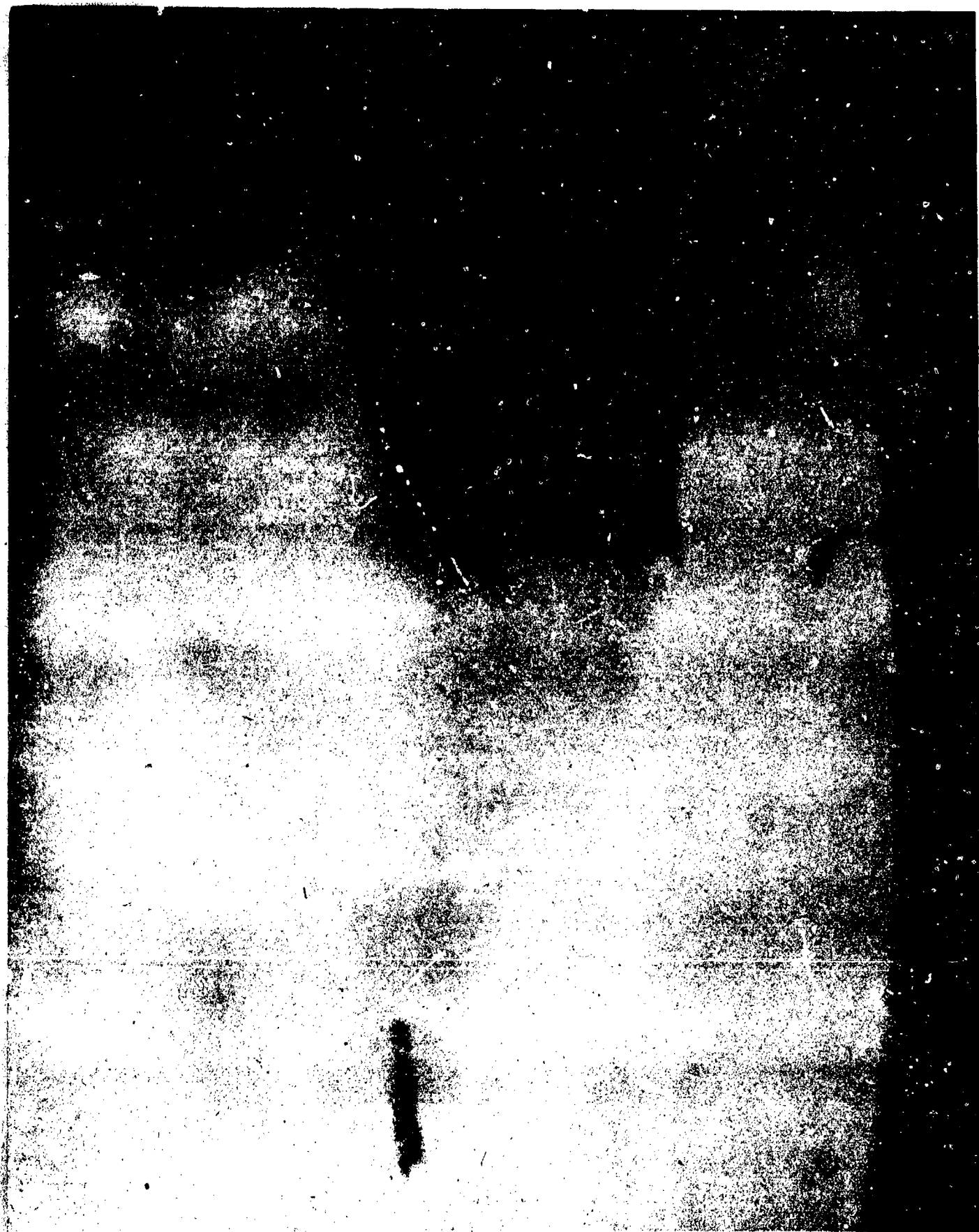
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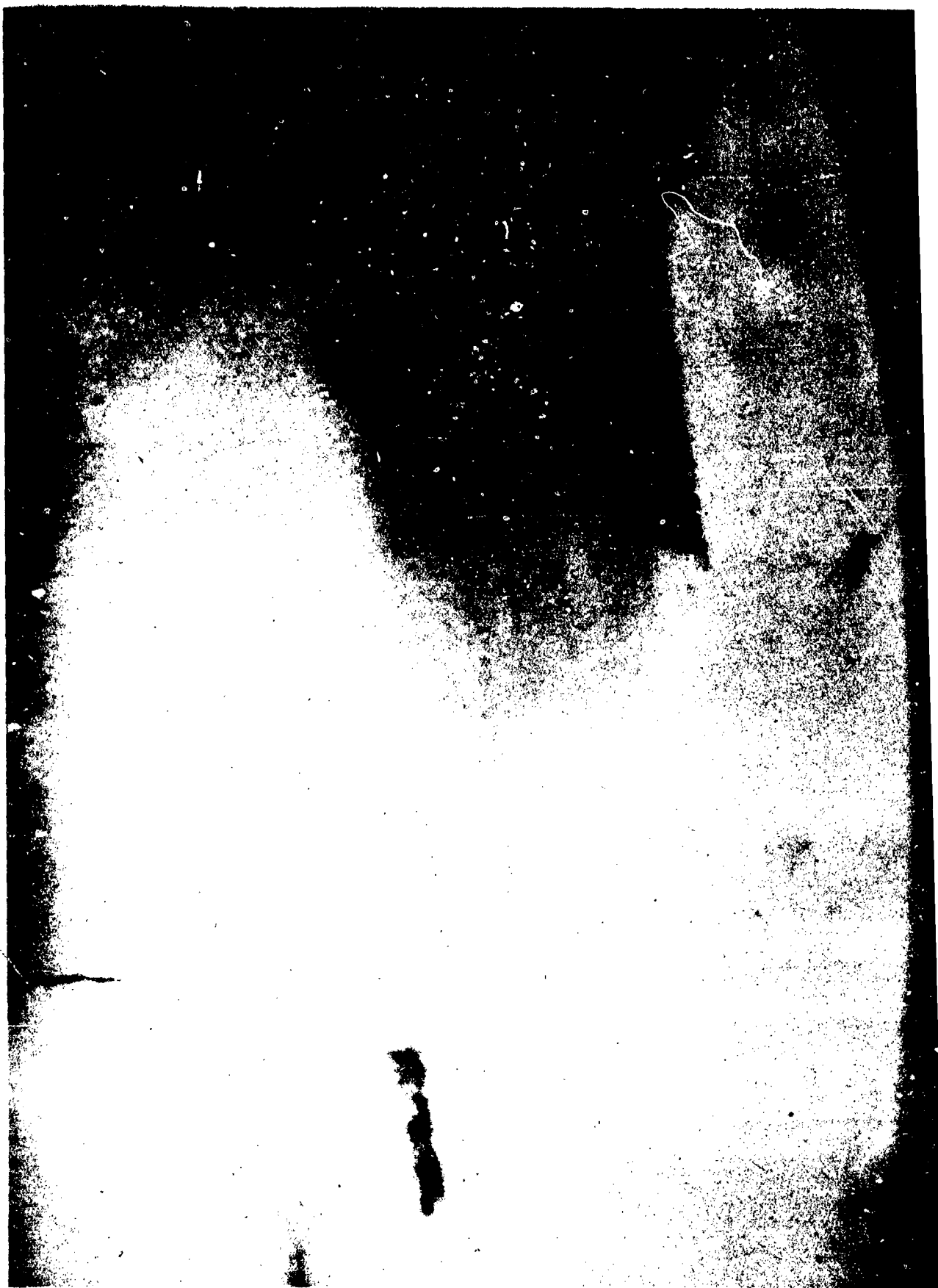
Navy film 1428E. Frame 682 - .68 seconds after detonation. Waves washing over ARKANSAS.

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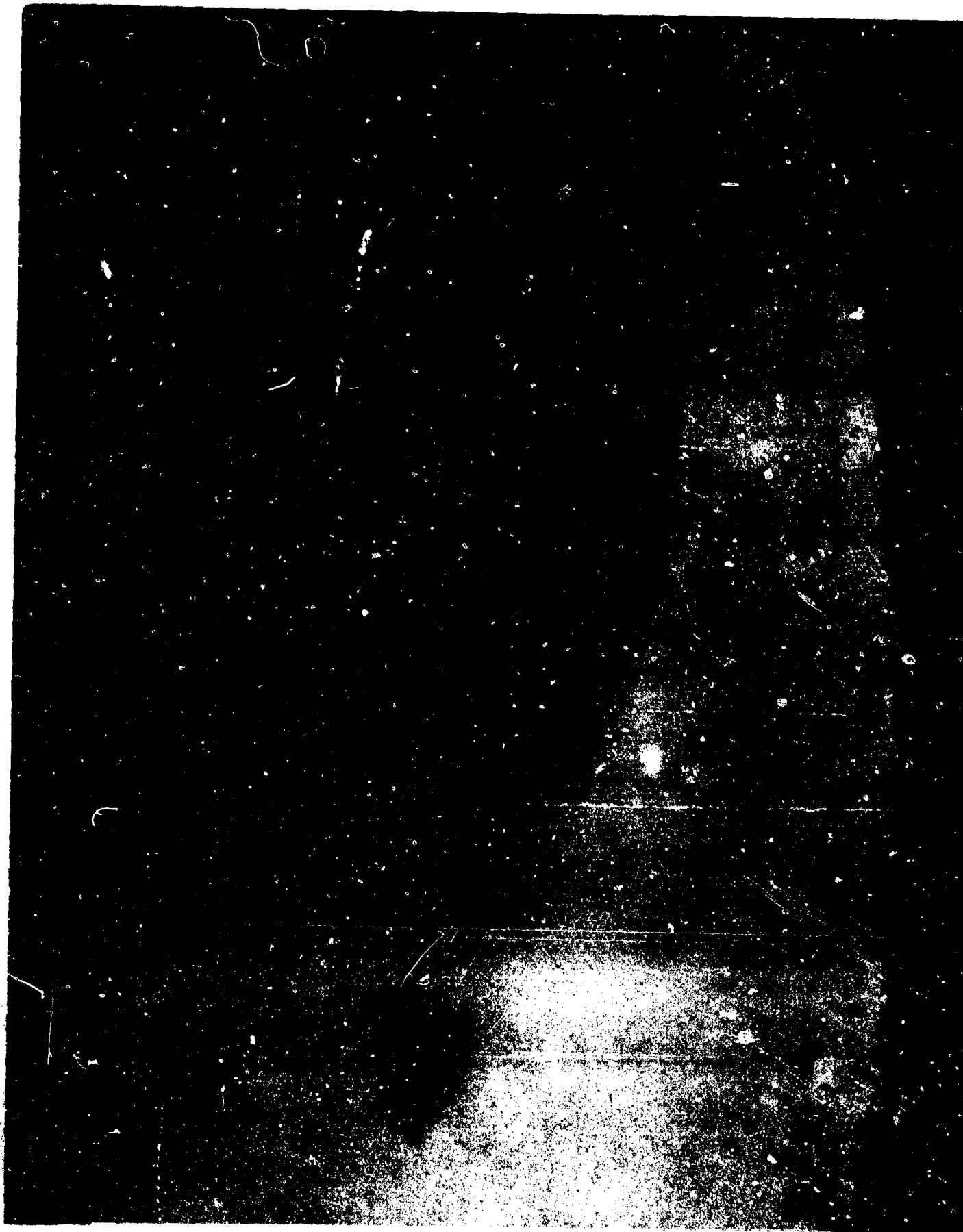


Navy film 1428E. Frame 746 - ARKANSAS partially obscured .75 seconds after detonation.

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Navy film 14287. Frame 780 - .78 seconds after detonation.

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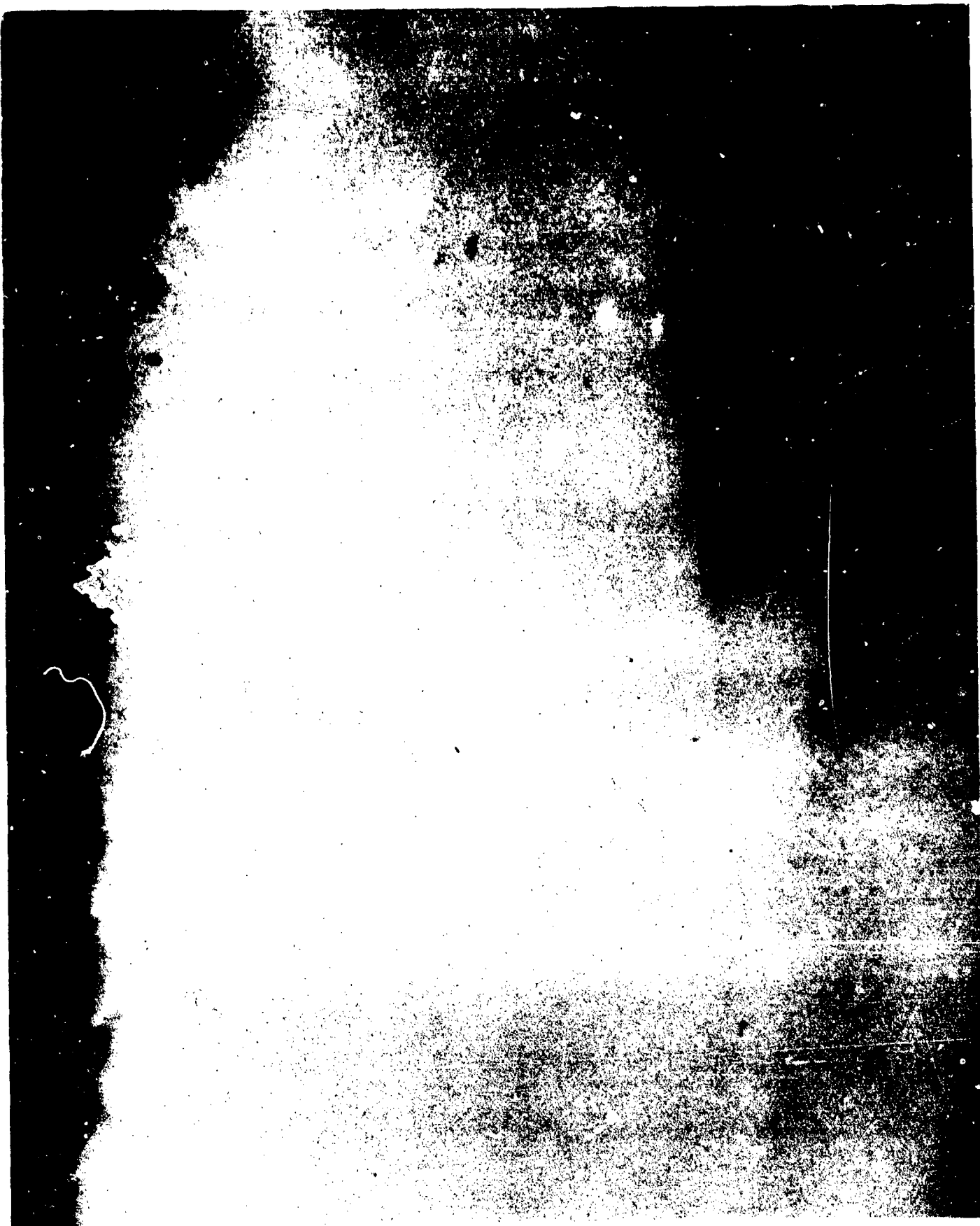
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Navy film 1428E. Frame 809 - Last vestige of ARKANSAS, .81 seconds after detonation.

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USS ARKANSAS (BB33)



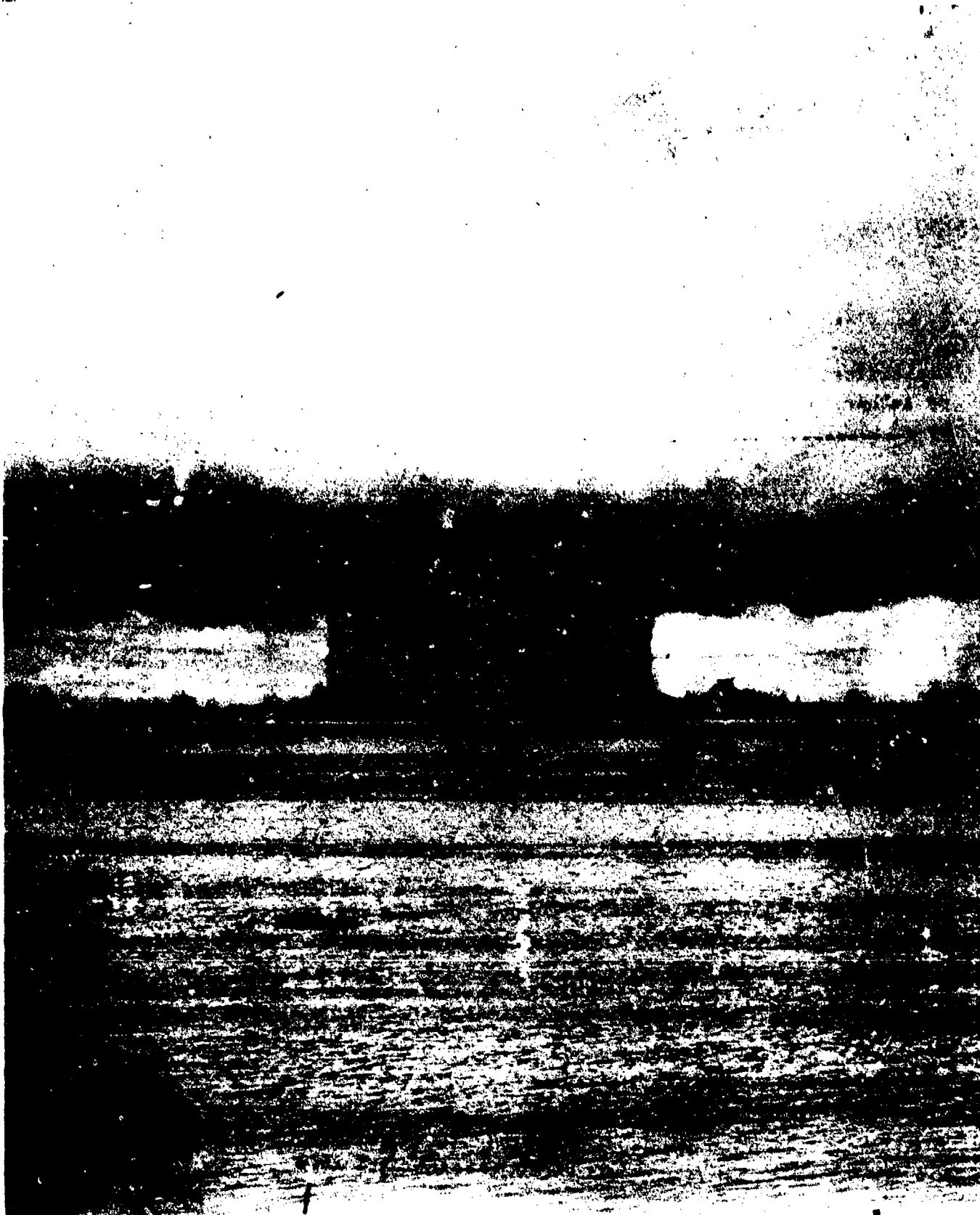
Navy film 1428E. Frame 1100. One second after detonation.  
ARKANSAS clouded out and never seen again.

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DB-CR-T2-11-320. Frame 2 - Dark spot in cloud is directly over target position of ARKANSAS. Picture taken little over 1 second after detonation.

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Defense Special Weapons Agency  
6801 Telegraph Road  
Alexandria, Virginia 22310-3398

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18 April 1997

MEMORANDUM FOR DEFENSE TECHNICAL INFORMATION CENTER  
ATTENTION: OMI/Mr. William Bush (Security)

SUBJECT: Declassification of Reports

The Defense Special Weapons Agency has declassified the following reports:

/✓AD-3665884	XRD-203-Section 12✓
x ——— AD-366589✓	XRD-200-Section 9✓
AD-366590✓	XRD-204-Section 13✓
AD-366591✓	XRD-183✓
/✓AD-366586x	XRD-201-Section 10✓
/✓AD-367487.4	XRD-131-Volume 2✓
✓✓AD-3675164	XRD-143✓
✓✓AD-3674934	XRD-142✓
AD-801410L✓	XRD-138✓
AD-376831L✓	XRD-83✓
AD-366759✓	XRD-80✓
✓✓AD-376830L4	XRD-79✓
/✓AD-376828L4	XRD-76✓
/✓AD-367464.x	XRD-106✓
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/✓AD-367459x	XRD-100✓

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AD-376836L ✓	XRD-98 ✓
AD-376835L ✓	XRD-97 ✓
AD-376834L ✓	XRD-96 ✓
AD-376833L ✓	XRD-95 ✓
X AD-376832L ✓	XRD-94 ✓ <i>re-ingest</i>
✓✓ AD-367458 ✓	XRD-93 ✓
<del>AD-367457</del> ✓	XRD-92-Volume 2 ✓
<del>AD-367456</del> ✓	XRD-91-Volume 1 ✓
<del>AD-367455</del> ✓	XRD-90 ✓
<del>AD-367454</del> ✓	XRD-89 ✓
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<del>AD-367452</del> ✓	XRD-87 ✓
AD-366764 ✓	XRD-86 ✓
AD-376837L ✓	XRD-99
AD-366758 ✓	XRD-78 ✓
AD-366734 ✓	XRD-44 ✓
AD-366763 ✓	XRD-85 ✓
AD-376829L ✓	XRD-77 ✓
✓✓ AD-367462 ✕	XRD-103 ✓
✓✓ AD-367463 ✕	XRD-104 ✓
✓✓ AD-367461 ✕	XRD-102 ✓
AD-367460 ✓	XRD-101 ✓



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In addition, all of the cited reports are now **approved for public release; distribution statement "A" now applies.**

*Arldith Jarrett*

ARDITH JARRETT

Chief, Technical Resource Center